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Promoting Readiness through Environmental Stewardship

Developing an Exit Strategy to Facilitate the Remedial Decision Process

**E. Kinzie Gordon & Leigh Benson
Parsons
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Presentation Overview

- **Basis for Developing an Exit Strategy (DERP Goals)**
- **Key Elements of an Exit Strategy**
- **Case Example: Vadose-Zone Soil Exit Strategy**
- **Case Example: Groundwater Exit Strategy**
- **Relevance to CTC and STC Estimates**
- **Q&A**



Current DERP Goals

- **Goal 1:**
 - **Desired Endpoint:** Reduce risk to human health and the environment
 - **Means:** through implementation of effective, legally compliant, and cost-effective response actions.
- **Goal 2:**
 - **Desired Endpoint:** Make property environmentally suitable for transfer.
- **Goal 3:**
 - **Means:** Put final remedies in place, and
 - **Desired Endpoint:** complete response actions.
- **Goal 4:**
 - **Desired Endpoint:** Expedite termination of DoD-funded environmental liabilities
 - **Means:** by completing specific stages of the response process by specific dates (i.e., milestone requirements).



Current DERP Implementation

Perceived lack of progress toward meeting **Goal 1** has resulted in mandated schedules to

- Expedite termination of DoD-funded environmental liabilities by completing specific stages of the response process by specific dates (i.e., milestone requirements) (**Goal 4**),

So that Components can show that they have

- Put final remedies in place (**Goal 3**),

Which presumably will allow DoD to

- Make property environmentally suitable for transfer (**Goal 2**),

Assuming that the Component has

- Reduced risk to human health and the environment through implementation of effective, legally compliant, and cost-effective response actions (**Goal 1**).

But the critical element of this decision logic is missing

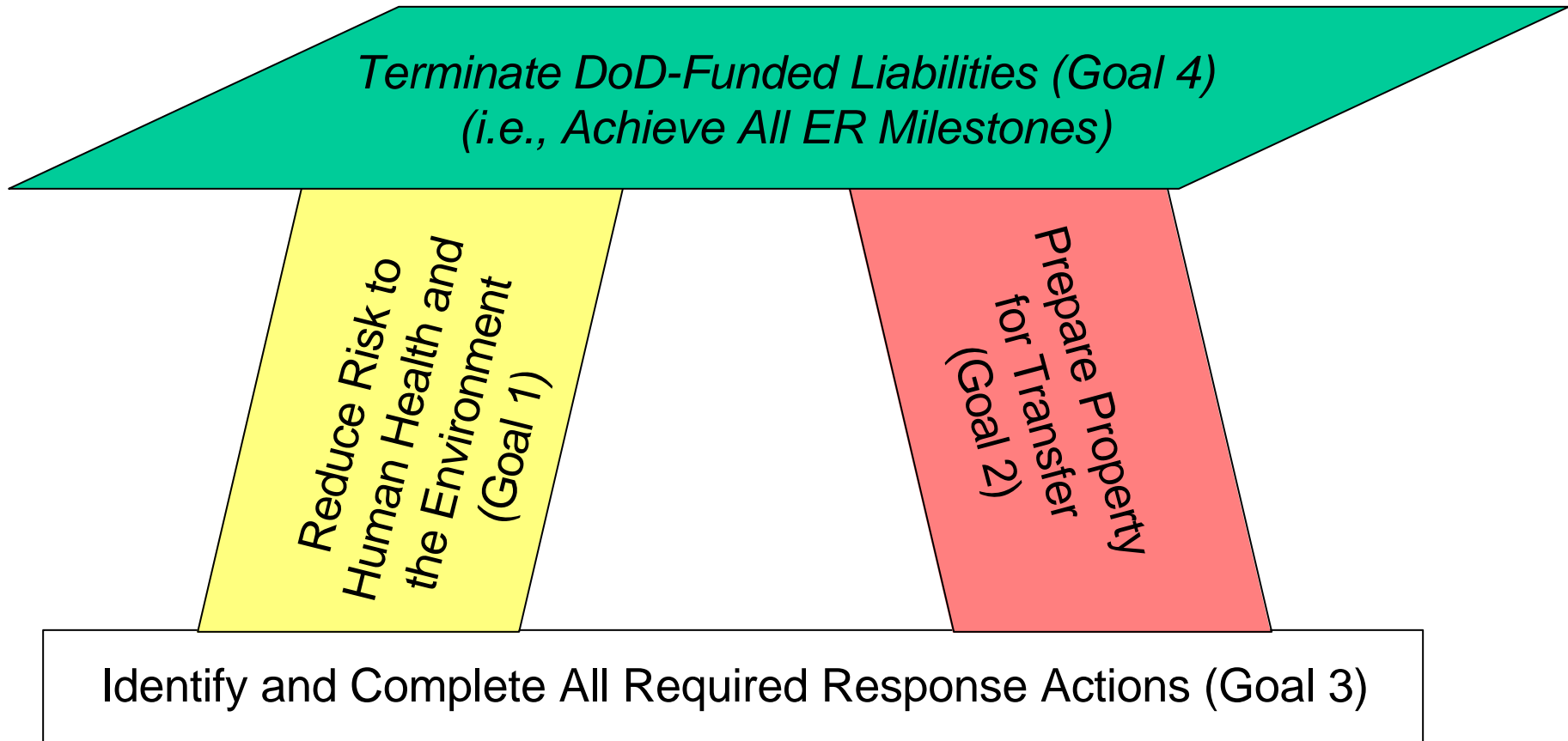


Refocusing on the Ultimate ER Goal

- The ultimate goal of the DERP is to **complete all environmental response actions (Goal 3)**, not just to put remedies into place or achieve administrative milestones
- A well-defined exit strategy - endorsed by all stakeholders in advance of final remedy selection and implementation – can minimize surprises and long-term impacts on being able to achieve the DERP goals
- Exit strategies are consistent DERP requirements and with CERCLA and RCRA Reform objectives



Foundation of the DERP





Air Force & DLA Approach

- Remedial Process Optimization (RPO) program was initiated to review P&T systems and all other remedial plans that require long-term response or management
- RPO emphasizes use of:
 - More effective long-term groundwater remediation strategies (i.e., alternative cleanup methods and *achievable* remedial action objectives, or RAOs)
 - Short-term system optimization opportunities
- Designed to support more realistic cost- and schedule-to-complete (CTC and STC) estimates

***RPO is DoD's investment in
"smarter/faster/cheaper" ER strategies***



Implementing the DERP with RPO

- An “exit strategy” requires *realistic* assessments of the:
 - Complexity of site conditions,
 - Performance capabilities of available remedial technologies and management options,
 - Protective alternatives to “default” and/or infeasible RAOs, and
 - Degree of confidence in data necessary to terminate response activities
- An independent assessment of your ERP honors the Superfund/DERP process, which calls for periodic “reality checking” of prior stakeholder ER decisions



The Basics of RPO

- **What:** A comprehensive third-party performance evaluation of remedial systems and/or remedial plans
- **Why:** To comply with the DERP by
 - Verifying that the remedial strategy is capable of achieving RAOs in a reasonable time-frame (Can we do what we say we can do? What *can* we do? How much will it cost and how long will it take?).
 - Identifying “smarter/faster/cheaper” remedial strategy (What’s the best strategy to achieve all of our ER goals?).
 - Improving the operational effectiveness of remedial strategies (Can we increase the short-term effectiveness of limited DoD resources?).
- **When:** Ideally, during the remedy planning process, or during the CERCLA five-year review process



Defining an Exit Strategy





Exit Strategy Elements

- **Clear and concise problem statement that**
 - Specifies the condition(s) requiring action
 - Bounds the likely response(s) appropriate for consideration
 - Focuses data collection on reducing key uncertainties to support remedy selection and implementation
- **Specification of the information needed to demonstrate that**
 - Desired remedy performance has been achieved
 - Response objectives have been met
 - Associated activities can be terminated



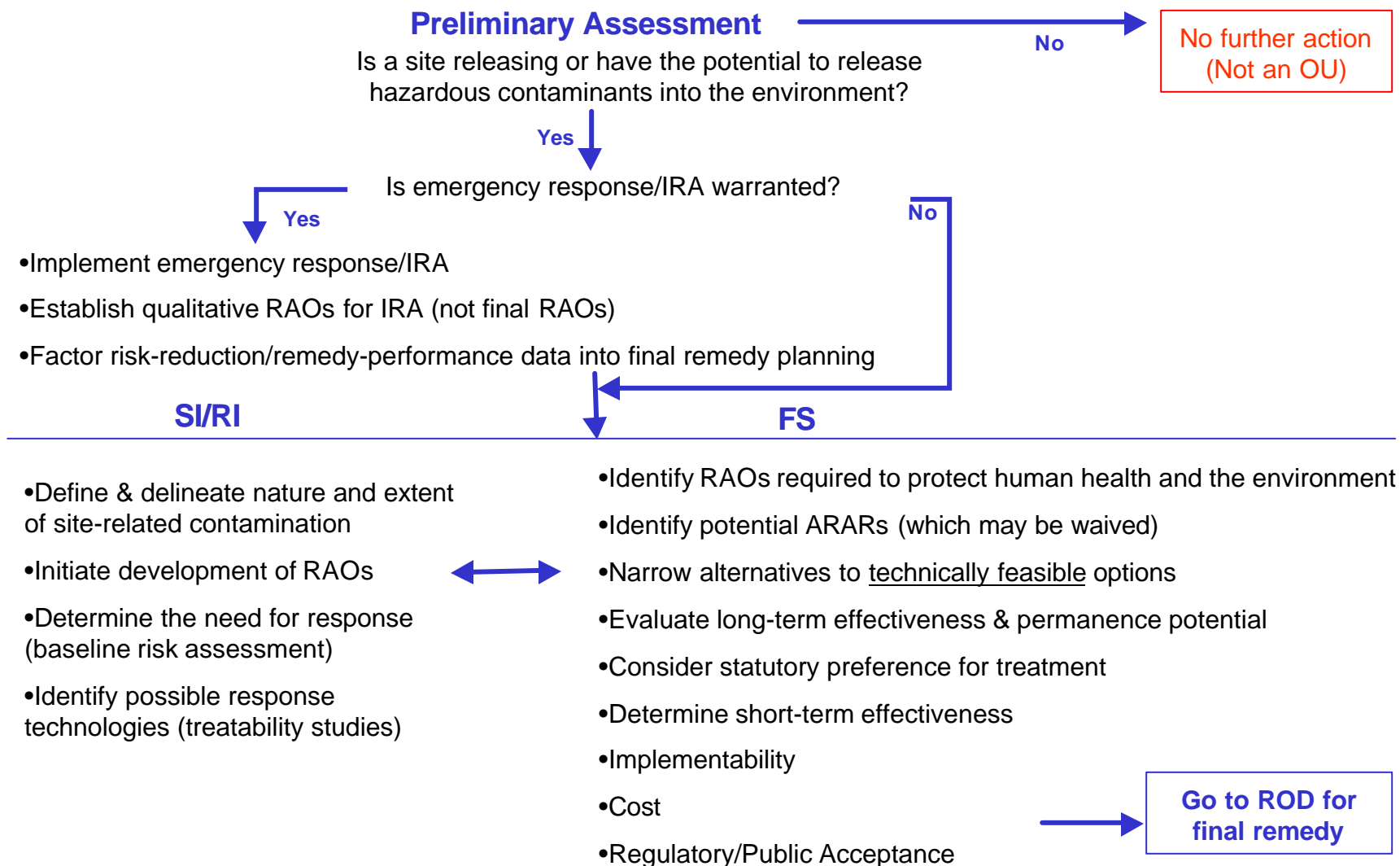
Exit Strategy Elements

- **Environmental progress/performance metrics**
 - Mechanistic milestones (e.g., issuance of ROD, RD completion)
 - Results-based milestones (e.g., progress toward cleanup objectives, environmental indicators of compliance)

- **Remedy development and implementation must be consistent with the overall exit strategy**
 - Establish performance-based metrics in decision process
 - Incorporate evolving site and remedial knowledge into remedy development and review process
 - Encourage real progress toward achievable cleanup goals



Building an Exit Strategy





Implementing an Exit Strategy

Final ROD

- Detail each remedial component
- Describe basis for each component
- Identify short-term and final RAOs
- Describe performance metrics to assess progress toward RAOs
- Outline contingency plans



RD/RA Phase

- Develop plans and specifications for each remedial component to ensure OPS and site completion
- Define decision criteria for each remedial component (monitoring requirements and if/then decision logic toward interim and final RAOs)
- Establish **results-based methodology for interpreting system O&M and groundwater monitoring data**
- Integrate project cost/schedule tracking data with technical performance data
- Periodically evaluate need for contingency plans
- Implement selected remedial action (RA)

Construction complete listing (CCL)

CCL/PCOR

Interim RA Completion Report (GW/SW only) Preliminary Closeout Report (PCOR)

- Use site-specific O&M and other periodic environmental compliance monitoring data **to verify and attribute** progress made by each specific remedial component toward RAOs
- Project timeframe to achieving final RAOs
- Acknowledge any early potential for material deficiencies (e.g., non-compliance events, variances from design to operation, anomalous temporal-trend data)
- Include RA contract inspection results and/or OPS documentation (for engineered systems only)
- Confirm consistency with other OUs toward facility closeout

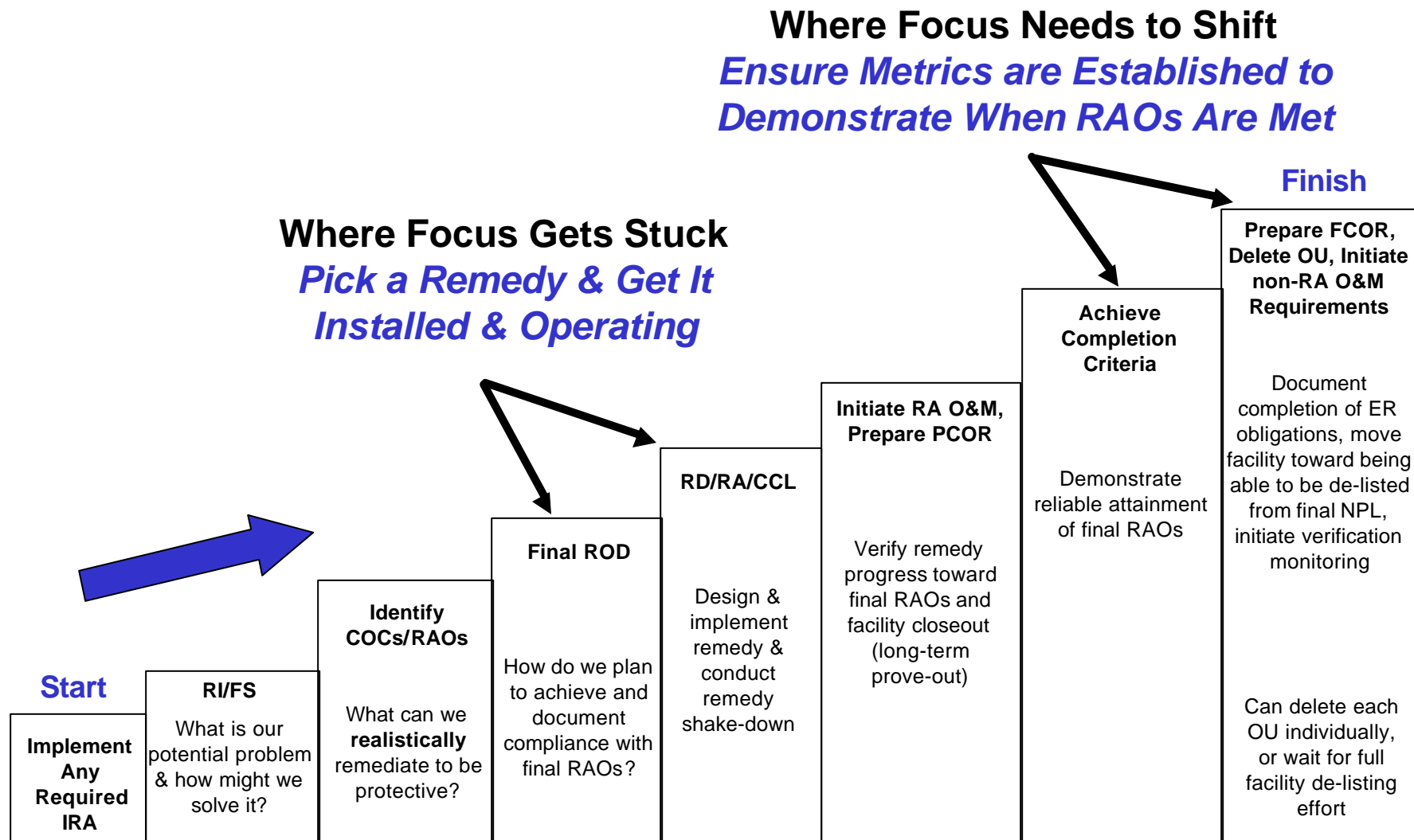


Final RA/Site Completion (All Media) Final Closeout Report (FCOR)

- Continue extended **non-RA O&M phase** (e.g., verification monitoring)
- Present detailed information on the remedy performance
- Verify attainment of final RAOs (through required series of formal RA completion inspections)
- Summarize project costs and technology performance results into a “lessons learned” synopsis



Steps to Response Complete





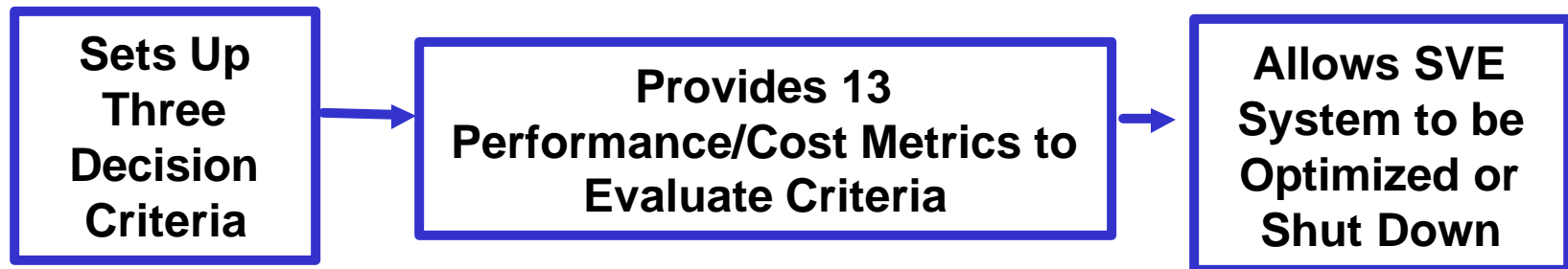
Exit Strategy Planning

- **Questions for strategy planning discussions:**
 - **Is there a problem requiring action?**
 - **If so, what is the problem?**
 - **What are the appropriate actions to consider?**
 - **What uncertainties must be reduced prior to selecting a remedy, and what uncertainties can be managed during remedy implementation (i.e., data needs vs. data gaps)?**
 - **What information will be used to demonstrate when the action is complete (i.e., that RAOs have been achieved)?**
 - **What information will be used to trigger implementation of an alternative remedial action should the selected remedy fail to meet response objectives?**



Remedy-Specific Case Example: Soil Vapor Extraction

- **The Castle AFB SVE Termination or Optimization Process (STOP) protocol provides metrics that enable the Component to optimize or shut-down soil-vapor extraction systems by documenting specific performance data**



- **All stakeholders endorse the STOP protocol during the remedy planning stage, thereby avoiding later disagreement on when a site has achieved “response complete” status**



Groundwater Case Example: Defense Supply Center Richmond

- **DSCR is an NPL site with multiple source areas and at least three groundwater contaminant plumes**
- **Groundwater COPCs are CAHs and various inorganics**
- **COPCs originated from submerged landfill wastes, and other potential DNAPL release areas**
- **CAHs have affected two water-bearing units and have migrated off-facility to the east**
- **A P&T IRA was installed in 1996 as part of a phased response to control off-site CAH plume migration, initiate risk reduction, and reduce CAH mass**
- **Extracted groundwater is treated via air stripping and discharged to surface water**
- **No final cleanup goals have been established for groundwater at DSCR**



Comparative-Outcomes Analysis

Previous ER Strategy

- P&T system presumed to be a core element of the final GW response
- Incomplete CSM limited design requirements of P&T to organics only
- Lack of emphasis on RAOs suggests MCLs = “default” RA endpoint
- Negligible mass-removal achieved demonstrates that P&T not feasible to effect COPC recovery
- Hydraulic constraints allow only partial COPC containment
- Off-site contamination not specifically targeted by planned RA
- Inter-media transport and release mechanisms not considered

Proposed Exit Strategy

- Supplement P&T with source control and alternative *in-situ* treatment/containment
- Expand CSM to address source and nature of all COPCs
- Establish spatially-defined and protective alternate concentration limits (ACLs)
- Refocus P&T objectives on containment and optimized treatment capacity; supplement with alternative treatment options
- Supplement with alternative containment systems (e.g., passive barriers)
- Consider zones of attainment for compliance, and point-of-use treatment
- Complete comprehensive risk assessment in support of ACLs for all media



DSCR Path Forward to Groundwater Response Complete

Long-term RA O&M begins
(and never ends ... response
never complete because
MCLs not achievable)

Performance-based RA O&M
begins (and ends in a
reasonable timeframe because
ACLs are achievable)

Retain and expand P&T as
final GW remedy

Pursue MCLs as policy-based
cleanup requirements

Supplement P&T with “smarter/faster/
cheaper” alternative technologies

Replace policy-based cleanup goals
with health-protective ACLs (waive
MCLs with TI, equivalency, cost-
benefit, inconsistency determinations)

No Defined Exit Strategy

Performance-Based Exit Strategy

IRA

Lessons Learned (or not)

Promoting Readiness through Environmental Stewardship



Exit Strategies & CTC Estimates

- CTC estimates = \$\$ required to **terminate** ER activities based on site-specific evaluations
- CTC estimates help answer these questions
 - Where should we focus our \$\$?
 - How much \$\$ do we need now and in the future?
 - Are we on track to response complete? If not, why not?
 - Are there any short-term \$\$ savings opportunities?
- CTC estimates must include all anticipated costs required to achieve RC at each site

RD + RA + RA-related O&M + management
- Per the DERP, ***you must have an exit strategy*** (RAO definition, RA performance metrics, termination criteria) in order to prepare a CTC estimate



Applied Science

***You May Now Develop and Execute Your
Own Exit Strategy!***

***Thanks for Your Attention
and
Have a Great Evening!***